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10/020,040	10/18/2001	Robert J. Crowley	267/017	8429

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EXAMINER

CONNOLLY, PATRICK J

ART UNIT PAPER NUMBER

2877

DATE MAILED: 01/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/020,040

Applicant(s)

CROWLEY ET AL.

Examiner

Patrick J Connolly

Art Unit

2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 17 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,4-6,8-38 and 40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4-6,8-38 and 40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments with respect to claims 1, 4-6, 8-38, 40 have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4-6, 8-12 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S Patent No. 5,843,145 to Tenhoff, and further in view of U.S. Patent No. 5,321,501 to Swanson et al. (Swanson).

As to claims 1 and 38, Tenhoff teaches an imaging system including (see Figures 7, 8):  
an ultrasound console(104);  
an interferometer (Figure 8, also Swanson et al);  
wherein the ultrasound console processes data provided by the interferometer to form an image for display (104).

With further regard to claims 1 and 38, Tenhoff teaches, by way of incorporation of reference of U.S. Patent No. 5,321,501 to Swanson et al, a method and apparatus for analyzing a surface including (see Swanson figure 9, 1B, also column 15, lines 34-65): forming a sample and reference light beam by way of an interferometer; combining light received from the surface with

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reference light beam; detecting combined light with a multi element detector to output a plurality of parallel signals; converting processed parallel signals to serial signal; and providing the serial signal to the ultrasound processor for imaging.

Swanson teaches a multi element photodetector (52A, 52B, 52C).

Swanson teaches a parallel to serial converter (see Figure 9, 55A, 55B, 55C).

It would have been obvious to one of ordinary skill in the art at the time of invention to include the interferometer and processing setup of Swanson et al in the ultrasound and interferometer set up of Tenhoff in order to process images more complexly.

As to claim 4, Tenhoff teaches multiple inputs coupled to the ultrasound console (see column 4, lines 30-35).

As to claim 5 and 6, Tenhoff teaches a catheter (see Figure 9).

As to claim 8, Swanson teaches the use and processing of analog serial data through the use of electronic circuitry (see column 15, lines 34-65).

As to claim 9, while Swanson does not teach the use and processing of digital serial data specifically, it is notoriously well known in the art to use both digital and analog data for processing. It would have been obvious to one of ordinary skill in the art at the time of invention to configure the apparatus of Tenhoff by way of Swanson et al. to process either analog or digital data, as they are functionally equivalent.

As to claim 10, while Swanson does not teach two multi-element detectors, he does teach several single element detectors connected in parallel for parallel to serial processing (see Figure 9).

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It would have been obvious to one of ordinary skill in the art at the time of invention to replace the multiple single element detectors with several multi-element detectors so that the apparatus could be more compact.

As to claim 11, Tenhoff teaches an interferometer comprising (see Figure 8):

means for creating a sample light beam and a reference light beam from a light source (208-210, 225-233);

means for conveying the sample light beam to a sample (207, 208);

means for introducing a time delay (226);

means for combining said beams for detection (208, 211);

As to claim 12, Tenhoff teaches a beam splitter (208).

Claims 13-16, 28 and 32, are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,830,145 to Tenhoff in view of U.S. Patent No. 5,321,501 to Swanson et al. (Swanson) as applied to claims 1-12 and 38 above, and further in view of U.S. Patent No. 5,943,133 to Zeylikovich et al.

As to claims 13-16, 28 and 32, Zeylikovich teaches a method and apparatus for performing optical coherence tomography including using a diffraction grating to introduce a time delay and combining beams (see for example figure 11). Zeylikovich also teaches using multiple beam splitters to combine light, as is notoriously well known in the art.

It would have been obvious to one of ordinary skill in the art at the time of invention to include a diffraction grating and multiple beam splitters in the ultrasound console with interferometer combination of Tenhoff, as these interferometers are used for similar

measurements, and are well known to be used in combination with ultrasound measuring techniques.

Claims 17-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,830,145 to Tenhoff in view of Swanson and in view of U.S. Patent No. 5,943,133 to Zeylikovich as applied to claims 13-16 above, and further in view of U.S. Patent No. 6,143,003 to Tearney et al (hereafter Tearney).

As to claims 17-20, 22, 24, 25, 29, 33 and 34, Tearney teaches a method and apparatus for performing optical coherence tomography including an interferometer (see Figure 3, column 6, lines 15-25). In the interferometer, Tearney teaches that the optical couplers (acting as beam splitters) do not have to divide radiation equally. Tearney goes on to explain that the division of radiation should be determined by noise limitations. It would have been obvious to one of ordinary skill in the art at the time of invention to choose a combination beamsplitters of different proportions in the apparatus of Zeylikovich in order to improve measurements.

As to claims 21, 26, 28 and 32, Tenhoff teaches, by way of incorporation of reference of U.S. Patent No. 5,321,501 to Swanson et al, a method and apparatus for analyzing a surface including (see Swanson figure 9, also column 15, lines 34-65): forming a sample and reference light beam by way of an interferometer; combining light received from the surface with reference light beam; detecting combined light with a multi element detector to output a plurality of parallel signals; converting processed parallel signals to serial signal; and providing the serial signal to the ultrasound processor for imaging.

It would have been obvious to one of ordinary skill in the art at the time of invention to include this parallel to serial processing in combination with the diffraction grating and beam splitter combinations above, as it is well known to perform this sort of measurement in interferometry.

As to claim 27, 31 and 37, Zeylikovich teaches a focusing lens. It would have been obvious to one of ordinary skill in the art at the time of invention to include this lens in the apparatus of Tenhoff as it is notoriously well known in the art to use focusing lenses to improve measurement quality.

As to claims 23 and 32, Tearney teaches using optical circulators to direct light beams (Figure 3, 30). Optical circulators are notoriously well known in the fiber art. It would have been obvious to one of ordinary skill in the art at the time of invention to include circulators for light direction in the apparatus of Zeylikovich.

As to claims 30, 35 and 36, Tearney teaches using attaching an interferometer to a catheter (see Figure 12, also column 12). It would have been obvious to one of ordinary skill in the art at the time of invention to attach a catheter to the apparatus of Zeylikovich (see also column 1 of Zeylikovich).

As to claims 32-37, Zeylikovich teaches using fibers to transport light (see lines 30-40, also Figures 29, 30). Fibers are notoriously well known in the art and it would have been obvious to use them to transport light in the apparatus of Tenhoff.

Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,830,145 to Tenhoff.

As to claim 40, it would be obvious to one of ordinary skill in the art at the time of invention to choose a coupling sequence for the method and apparatus of Tenhoff depending on the desired order testing and measurement operations



***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick J Connolly whose telephone number is 703.305.4397. The examiner can normally be reached on 9 am-5.30 pm ... Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on 703.308.4881. The fax phone number for the organization where this application or proceeding is assigned is 703.872.9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703.308.0956.

pjc PJC

  
**Samuel A. Turner**  
**Primary Examiner**